CLAIMS

1. A method of jointly optimizing the performance of a probe and imager combination, comprising the steps of:

simulating images of a phantom which would be produced by said probe and imager combination in accordance with a statistical design of experiment, a probe geometry specification, and a set of imager parameters, said statistical design of experiment allowing a subset of said imager parameters to vary; and

quantifying the diagnostic value of each image simulated based at least in part on an image quality specification to produce simulation-based image quality data.

2. The method as recited in claim 1, wherein said probe geometry specification comprises a specification of layers in said probe, and said simulating step comprises the step of computing an impulse response based at least in part on said specification of layers in said probe.

3. The method as recited in claim 2, wherein said set of imager parameters comprises a definition of aperture geometry, and said simulating step further comprises computing acoustic diffraction based at least in part on said impulse response, said definition of aperture geometry and said phantom.

4. The method as recited in claim 1, wherein at least some of said imager parameters are retrieved from a database containing respective sets of imager parameters for pre-existing probes.

5. The method as recited in claim 2, wherein said step of computing an impulse response employs a one-dimensional acoustic stack design.

6. The method as recited in claim 1, further comprising the step of generating transfer functions based at least in part on said simulation-based

image quality data.

7. The method as recited in claim 6, wherein said image quality specification is a function of at least one image quality parameter, and at least one of said transfer functions relates said image quality parameter to said subset of imager parameters.

8. The method as recited in claim 7, further comprising the step of deriving a statistical distribution of said image quality parameter as a function of at least one imager parameter of said subset using at least one of said transfer functions.

9. The method as recited in claim 6, wherein said image quality specification specifies a value representing an overall image quality, and at least one of said transfer functions relates said overall image quality value to said subset of imager parameters.

10. The method as recited in claim 1, wherein said image quality specification is a function of at least the following: an image quality parameter and a range-dependent weighting coefficient corresponding to said image quality parameter.

11. The method as recited in claim 6, further comprising the step of optimizing imager parameters of said probe and imager combination based at least in part on said transfer functions.

12. The method as recited in claim 6, further comprising the step of optimizing said specification of layers in said probe based at least in part on said transfer functions.

13. The method as recited in claim 6, further comprising the step of generating a graph representing image quality as a function of cost based at least in part on said transfer functions.

14. A computer system comprising a display monitor, an operator interface, and programming for performing the following steps:

simulating images of a phantom which would be produced by a probe and imager combination in accordance with a statistical design of experiment selected via said operator interface, a probe geometry specification comprising at least a portion specified via said operator interface, and a set of imager parameters comprising at least one imager parameter set via said operator interface, said statistical design of experiment allowing a subset of said imager parameters to vary;

controlling said display monitor to display said simulated images; and

quantifying the diagnostic value of each image simulated based at least in part on an image quality specification to produce simulation-based image quality data.

15. The computer system as recited in claim 14, wherein said image quality specification comprises at least a portion selected via said operator interface.

16. The computer system as recited in claim 14, wherein said operator interface comprises a graphical user interface for selecting said statistical design of experiment.

17. The computer system as recited in claim 14, wherein said operator interface comprises a graphical user interface for setting said at least one imager parameter.

18. The computer system as recited in claim 14, wherein said operator interface comprises a graphical user interface for specifying at least said portion of said probe geometry specification.